

from Fashoda (Hawker Collection), and one from Abou Zeit, White Nile, sent by Captain Stanley Flower; and these two were identical specifically with Lady William Cecil's specimens*.

Type in the Gardens of the Zoological Society of London, presented by Lady William Cecil.

Examples of three species have been living throughout the summer and autumn in the same paddock on the canal-bank in the North Garden. The three examples of *B. regulorum* and one example of *B. paronina* keep together, and the similarity in size is obvious, while the different coloration of the neck and body and of the cheek-patches and the large wattles in the Cape form amply distinguish the species. The two examples of *B. ceciliae* keep together and away from the others. They are smaller, darker in the body, lighter as to the crowns and conspicuously redder as to the cheeks. It would be unwise to attach too much importance as to the natural grouping of birds in a menagerie, but it is striking that *B. paronina* consorts with *B. regulorum*, although the specific distinctness of the two has long been admitted, and not with *B. ceciliae*, with which it has hitherto been confounded.

4. On the Mouse-Hares of the Genus *Ochotona*.

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[The complete account of the new species described in this communication appears here; but since the name and preliminary diagnosis were published in the 'Abstract,' the species is distinguished by the name being underlined.—EDITOR.]

A large and valuable series of *Ochotona* from Kashmir, recently sent home by Col. A. E. Ward, has induced me to take up and study the whole genus, so far as the Palearctic Region is concerned, with the results given below.

Owing to the fact that these animals live in countries difficult to reach and, for the most part, inhospitable, the series of skins is somewhat meagre. Nevertheless I have been enabled to come to certain conclusions which may serve as a basis for the future study of the group.

Exclusive of the American forms, the genus is found in Southern Russia, extending northwards through Persia, Afghanistan, Kashmir, Thibet to N.E. Siberia.

Many of the species are closely allied and some, if not all, have both a summer and a winter pelage. I propose in the first place to divide the genus into three groups, which may be recognised by the shape of the incisive and palatal foramina.

* [Since the reading of this paper, four more Crowned Cranes from the White Nile have been deposited at the Gardens. These are examples of *B. ceciliae*.]

In the first group, which may be called the

Ladacensis Group, the incisive and palatal foramina are separate and distinct, the lower and posterior portions of the præmaxilla, although very thin, meeting in the middle line.

In the second group, which may be known as the

Rufescens Group, there is no bony division between the incisive and palatal foramina, but the incisive foramen is narrow and slightly constricted at its posterior end, whence it suddenly broadens out into what represents a large palatal foramen.

Lastly, there is the

Curzonie Group, in which the large single foramen is practically triangular in shape, with little or no constriction to mark the division between the incisive and palatal foramina.

The following is a list of all the names belonging to this genus under the special groups to which they belong, as well as the type-locality from which they came. In the body of the paper, however, I have considered some of them as synonyms or subspecies.

I. *Ladacensis* Group.

Type-Locality.

<i>Ochotona alpina</i>	Altai.
<i>O. hyperborea</i>	N.E. Siberia.
<i>O. normalis</i>	} Mouth of R. Maia, N.E. Siberia.
<i>O. ferruginea</i>	
<i>O. cinereoflava</i>	
<i>O. fusca</i>	
<i>O. littoralis</i>	S. of C. Tschukosky.
<i>O. ladacensis</i>	Ladak.
<i>O. ogotona</i>	Beyond L. Baikal and Desert of
<i>O. erythrotis</i>	Gannsu, N. Thibet. [Gobi.
<i>O. rutila</i>	Vernoe Mts., Turkestan.

II. *Rufescens* Group.

<i>O. rufescens</i>	Cabul, Afghanistan.
<i>O. koslowi</i>	N. Thibet.
<i>O. pusilla</i>	S.E. Russia and S.W. Siberia.
<i>O. wardi</i>	Kashmir.

III. *Curzonie* Group.

<i>O. curzonie</i>	Sikkim.
<i>O. melanostoma</i>	Kuku-noor, S. Thibet.
<i>O. daurica</i>	Dauria.
<i>O. macrotis</i>	Doba, Turkestan.
<i>O. aurita</i>	Pangong Lake, Ladak.
<i>O. grisea</i>	Kuenlun R., S. of Sanga Pass.
<i>O. roylei</i>	Choor Mts.
<i>O. nepalensis</i>	Nepal.
<i>O. hodgsoni</i>	Ladak.
<i>O. tibetana</i>	Moupin, N.W. Szechuen.

Key to the Species.

- A. Palatal and incisive foramina distinct.
- a*¹. Ears small, 24 mm. or less.
 - a*². Colour of upper parts uniform dull rufous.
 - a*³. Large. Hind foot 35 mm. *O. alpina*.
 - b*³. Smaller. Hind foot 26 mm. *O. hyperborea*.
 - b*². Colour of upper parts white or yellowish.
 - a*³. Ears rufous *O. ladacensis*.
 - b*³. Ears white *O. ogotona*.
 - b*¹. Ears large, 28 mm. Colour greyish; head and shoulders rufous.
 - a*². Post-auricular patch white *O. rutila*.
 - b*². Post-auricular patch red *O. erythrotis*.
- B. Palatal and incisive foramina *not* distinct.
- a*¹. Combined foramen narrowing in centre.
 - a*². Colour of upper parts uniform.
 - a*³. Size large: colour white or yellowish *O. koslowi*.
 - b*³. Smaller: colour brown *O. pusilla*.
 - b*². Colour of upper parts *not* uniform.
 - a*³. Colour brownish, with white collar behind ears *O. rufescens*.
 - b*³. Colour greyish, with red head and shoulders in summer *O. wardi*.
 - b*¹. Combined foramen *not* narrowing in centre.
 - a*². Ears small, 23 mm. or less.
 - a*³. Size small. Hind foot 25 mm. *O. hodgsoni*.
 - b*³. Larger. Hind foot not less than 28 mm.
 - a*⁴. Colour light.
 - a*⁵. Mouth black *O. melanostoma*.
 - b*⁵. Mouth white *O. daurica*.
 - b*⁴. Colour darker.
 - a*⁵. Uniform pale brown *O. curzoniae*.
 - b*⁵. Dark brown, rufous on head and shoulders *O. roylei*.
 - b*². Ears large, 27 mm. *O. macrotis*.

OCHOTONA ALPINA (Pall.).

Lepus alpinus Pallas, Glires, p. 52, pl. 2 (1778); id. Reise, ii. p. 701, tab. A (1773); Schreber, Säugthiere, iv. p. 911, pl. 238 (1792).

Lagomys alpinus (Pall.) Cuvier, Règ. Anim. p. 219 (1829); Waterh. Mamm. ii. p. 15 (1848); Radde, Reisen Süd. v. Ost-Sibirien, i. p. 232 (1862).

General colour of a uniform reddish brown, sometimes inclined to greyish. Fur long, soft, slate-grey at the base for about three-fourths of its length, the terminal portion being greyish or whitish with darker tip. Ears of moderate size, rounded, and thinly clad with hairs similar in colour to the body-hairs. Under parts uniform yellowish white, being sometimes rather more rufous across the breast.

The skull is stoutly built, but long and narrow. The incisive foramina are small and rounded, rather than narrow and elongate as is the case with other species. The muzzle is broad and stout, and the teeth large and strong.

Dimensions (approx. from skin). Head and body 175 mm.; hind foot 35; ear 20.

Skull. Greatest length 56 mm.; basal length 46; zygomatic breadth 25; length of nasals 18; length of molar series 10; interorbital breadth 6.

Habitat. Originally described from specimens from the Altai.

I have been unable to find any further particulars as to its range.

Our knowledge of this species is so scanty that it is impossible to give any information concerning any changes of pelage it may undergo, but it does not appear to ever become very light. There is a specimen in the British Museum of a uniform deep dark ruddy brown, marked "Siberia, melanistic variety," but further material may prove this to be a normal pelage of the species.

OCHOTONA HYPERBOREA (Pall.).

Lepus hyperboreus Pallas, Zoogr. i. p. 152 (1831).

Lagomys hyperboreus (Pall.) Wagner, Schreber, Säuegeth. Suppl. iv. p. 121 (1844); Waterh. Mamm. ii. p. 30 (1848); Schrenck, Amurlande, i. p. 147 (1859); Radde, Reisen Süd. v. Ost-Sibirien, i. p. 232 (1862).

Lagomys hyperboreus, varr. *normalis*, *ferruginea*, *cinereoflava*, *fusca*, Schrenck, Amurlande, i. p. 148 (1859).

Lagomys littoralis Peters, SB. Ges. naturf. Fr. Berlin, p. 95 (1882).

This species closely resembles the foregoing, except in its much smaller size. The five specimens from various parts of Eastern Siberia which are in the British Museum show a uniformity quite unusual among members of this genus. The general colour above is a light brownish rufous (mummy brown, Ridgw.), which is practically uniform throughout the upper parts, becoming rather purer rufous on the flanks owing to the absence of black tips to the hairs. The under parts are of a uniform rufous-white. The ears are small and scantily covered with whitish hairs.

Skull. Except in its size the skull bears a close resemblance to that of *O. alpina*.

Dimensions (approx. from skin). Head and body 160 mm.; hind foot 26; ear 14.

Skull. Zygomatic breadth 20 mm.; length of nasals 11; length of molar series 7; interorbital breadth 5.

Habitat. Described by Pallas as inhabiting N.E. Siberia. Schrenck has recorded it from the mouth of the river Maia on the mainland opposite Sakhalin, and I have examined specimens from Ussuri, Kentei Mountains in N. Mongolia, and Yakutsk.

Schrenck describes, under the names given in the synonymy, several varieties of this species. There can be little doubt as to the specific identity of these varieties, and they probably represent the different pelages assumed by this species, but from the material at my command I am unable to give any further information.

I also provisionally place *O. littoralis*, from a similar locality, under the same name, as a large amount of material will be required before these various forms can be elucidated.

OCHOTONA LADACENSIS (Günth.).

Lagomys ladacensis Günth. Ann. Mag. Nat. Hist. ser. 4, xvi. p. 231 (1875); Blanford, J. A. S. B. xlv. p. 110 (1875); id. Yarkand

Mamm. p. 71, pl. vi. fig. 1, pl. vii. fig. 2, pl. vii *a*. fig. 1 (1879); id. Faun. Brit. India, Mamm. p. 458 (1891); W. L. Sel. Cat. Calc. Mus. p. 110 (1891); Büchner, Mamm. Przew. i. p. 185 (1890).

Lagomys curzonie Stoliczka (*nec* Hodgs.), J. A. S. B. xxxiv. 2, p. 108 (1865); Anders. P. Z. S. 1871, p. 562.

General colour light brownish grey, many of the hairs, more especially along the dorsal region, tipped with dark brown. Head rather lighter, with dull rufous patch extending from nose to the crown. Ears moderately large and rounded, clothed externally with rufous hairs, longer on the inner margin. Under parts yellowish white, with a trace of a rufous collar, which is also visible on the shoulders. Feet clothed with white hairs.

The coat just described is that of an individual shot on the 22nd July, and represents a very typical skin; there are, however, other forms of pelage which it would be as well to notice, although I am unable to say exactly in what sequence they may be found.

Specimens in June have, as a rule, very short woolly rufous coats, sometimes shading to pale yellow and interspersed with long black hairs.

In September a moult takes place and the new coat is long and thick and of a warm brownish grey, becoming lighter and paler along the sides. The rufous markings mentioned in the first pelage described are present and visible but not so intense.

There is another specimen from the same place and date as the first mentioned, but the pelage is rather shorter, more woolly, and not so grey.

In a specimen in fresh pelage at the beginning of October the hairs are a deep slate-grey at the base, and shade through vinous to pale white, ending in a buff subterminal ring and a black tip.

I am of opinion that there is only one moult in the year, namely in September, and that during the summer the pelage gradually wears away, giving the animals the different appearances which I have noted above.

Of the *skull* not much need be said as, except in the foramina already alluded to, the specific differences between the skulls in this group are very slight. As, however, the figure given by Büchner (pl. xxiv. fig. 8) is rather misleading, it may be mentioned that the palatal foramen, as shown in fig. 2, much more resembles that of the type of *ladacensis*. In other respects fig. 8 accurately represents *ladacensis*, and it is unfortunate that the specimen figured should have been slightly abnormal in an important feature.

The *dimensions* of an adult male are :—Head and body 180·5 mm.; hind foot 35; ear 24.

Skull. Greatest length 49·5 mm.; basal length 39; zygomatic breadth 25; length of nasals 15; length of molar series 10; interorbital breadth 5.

Habitat. Originally described from Ladak. This species has also been found to the N.E. in Northern Thibet. It is seldom found at a lower elevation than 14,000 feet.

Type. B.M. 75.3.30.2. Collected by Col. J. Biddulph.

OCHOTONA OGOTONA (Pall.).

Lepus ogotona Pallas, Glires, p. 59, pl. 3 (1778); id. Zoogr. i. p. 157 (1811); Schreber, Säugthiere, iv. p. 915, pl. 239 (1792).

Lagomys ogotona (Pall.) Cuvier, Règ. Anim. p. 219 (1829); Waterh. Mamm. ii. p. 17 (1848); Radde, Reisen Süd. v. Ost-Sibirien, i. p. 226 (1862).

Lagomys pallasi Gray, Ann. Mag. Nat. Hist. ser. 3, xx. p. 220 (1867).

Closely allied to *O. ladacensis*, from which it differs in its much greyer and lighter colour; the general colour above being of a pale whitish grey, below white. There is a total absence of the rufous hairs on the ears so conspicuous a feature in the foregoing species.

The skull differs in no marked respect from that of *O. ladacensis*.

Dimensions (approx. from skin). Head and body 165 mm. (6" 7'" as given by Pallas); ear 21; hind foot 35.

Skull. Zygomatic breadth 25 mm.; length of nasals 16; length of molar series 10; interorbital breadth 3·5.

Habitat. Mountains beyond Lake Baikal and Desert of Gobi.

I have examined only one individual of this species, which, except for its colour, very much resembles *O. ladacensis*, of which it may eventually prove to be merely an Eastern race.

OCHOTONA ERYTHROTIS (Büchn.).

Lagomys erythrotis Büchner, Mamm. Przewalski, i. p. 165 (1890); id. loc. cit. pls. xxi. & xxiv. figs. 1-6 (1894).

The following description is taken from Büchner, as I have been unable to procure a specimen of this species. In summer the general colour above is of a dull rusty red; the head is similar in colour to the rest of the body, but the frontal region is somewhat lighter and the lips yellowish. The ear is thickly clothed on both sides with ferruginous hairs. The chin is yellowish, the chest reddish, and the remainder of the under parts and feet white. In its winter pelage, the lips and tip of the nose are white, the sides of the face and frontal region are whitish brown. The ears and a small patch immediately behind them are of a rusty red. The remainder of the body above and below is greyish white interspersed with blackish or brownish hairs.

The *skull*, compared with that of *O. ladacensis*, is rather smaller; the muzzle is stouter and shorter, but the skull itself rather narrower. According to Büchner, except for its narrower and more slender build it closely resembles that of *O. rutila*, the next species.

Dimensions (after Büchner). Head and body 245 mm.; ear 28; hind foot 42.

Skull. Greatest length 46·5 mm.; basal length 37; zygomatic breadth 23·7; length of nasals 15·8; length of molar series 8.

Habitat. Gamsu and Burchan Budda Mts., N.E. Thibet.

This species, although clearly belonging to the *ladacensis* group, shows, in its external colouring, affinities towards Col. Ward's new species, to be hereafter described.

OCHOTONA RUTILA (Severtz.).

Lagomys rutilus Severtzoff, Voy. 1873; id. Ann. Mag. Nat. Hist. ser. 4, xviii. p. 168 (1876); Blanf. Mamm. Yark. Miss. p. 79 (1879); Schäff, Zool. Jahrb. (Syst.) ii. p. 65 (1887); Büchn. Mamm. Przew. i. p. 160, pl. xx. (1890); id. loc. cit. p. 191 (1894).

This species apparently differs so slightly from the foregoing that it is doubtful whether they can be considered as more than geographical races.

A male shot on the 21st June in Turkestan has the whole of the back behind the shoulders of a whitish grey. The whole of the head and shoulders, with the exception of the ears, is of a lighter rusty (lighter, according to Büchner, than in *O. erythrotis*). The ears are large, being about the same size as those of *O. macrotis*, and covered on both sides with short grey hairs, while a small patch behind the ears, which in *O. erythrotis* is always red, is in this species always white, and forms the most conspicuous feature distinguishing these two species. The feet are grey; the under parts whitish, with a more rufous collar round the throat.

The skull shows hardly any features to distinguish it from the foregoing.

Dimensions (approx. from skin). Head and body 196 mm.; hind foot 39; ear 28.

Skull. Greatest length 50 mm.; basal length 42; zygomatic breadth 24; length of nasals 16; length of molar series 9.5; interorbital breadth 6.

Habitat. Vernoe Mountains, Turkestan.

It seems to me very doubtful whether these last two species can really be regarded as distinct, but our knowledge of them is at present so slight that it seems best meanwhile to consider them so. In the large ears this species resembles *O. macrotis* Günth., while it is perhaps instructive to note that superficially the difference, *e.g.* presence or absence of white postoral patches, between *erythrotis* and *rutila* is very similar to that between *roylei* and *wardi*.

OCHOTONA RUFESCENS (Gray).

Lagomys rufescens Gray, Ann. Mag. Nat. Hist. x. p. 266 (1842); Hutton & Blyth, J. A. S. B. xv. p. 140 (1846); Waterh. Mamm. ii. p. 20 (1848); Horsf. Cat. E.-I. Mus. p. 149 (1851); Blyth, Cat. p. 133 (1863); Blanf. E. Persia, p. 83, pl. 6. fig. 2 (1876); Wood-Mason, P. A. S. B. p. 173 (1880); Scully, J. A. S. B. lvi. p. 76 (1886); Murray, Ann. Mag. Nat. Hist. ser. 5. xiv. p. 100 (1884); Radde, Zool. JB. iv. p. 1053 (1889); W. L. Schl. Cat. Mamm. Calc. Mus. ii. p. 111 (1891); Blanf. Faun. Br. Ind., Mamm. p. 458 (1891).

In its winter pelage (Oct.) this species is of a uniform whitish brown, somewhat paler on the sides and of a pale yellowish buff beneath. Each hair is slate-grey for its basal two-thirds and

then dirty white, with a subterminal buff ring and dark brown tip. The dark tips are absent on the hairs of the feet and under parts, and absent or inconspicuous on a patch behind either ear, which patches tend to meet across the nape. On the frontal region the buff subterminal ring extends down to the grey base and is more rufescent. In summer the pelage is similar, but the colour on the back and head tends to be more rufescent, and that of the flanks and under parts a purer white. The white patches behind the ears are larger, and have coalesced on the nape forming a broad white collar, succeeded posteriorly by a rufescent collar of about half its width, which gradually merges into the general reddish colour of the remainder of the body. This rufescent collar starts from two maroon patches situated on the under side of the neck, and may thence be traced upwards and backwards, becoming paler and more rufous in colour, to meet over the shoulders in the middle line. The maroon patches form a distinctive feature of this species, but they are not always to be seen in the winter pelage.

The *skull* may best be described by comparing it with that of *O. ladacensis*, from which it differs in being broader across the muzzle. The bullæ are more rounded and swollen, thereby narrowing the basioccipital. The main difference, however, lies in the incisive and palatal foramina, which are not, as in *O. ladacensis*, separated, but form one large foramen slightly constricted about one-third of the way from its anterior end. The portion anterior to this constriction is of uniform width and narrow, the posterior portion gradually widening out throughout its length. This distinction forms the difference between the two groups.

Dimensions (approx. from skin). Head and body 175 mm.; hind foot 32; ear 22.

Skull. Greatest length 52 mm.; basal length 42; zygomatic breadth 24; length of nasals 16; length of molar series 10; interorbital breadth 3.

Habitat. The type came from Barber's Tomb, Rocky Hills, near Cabul; but its range extends throughout Afghanistan, extending into Persia and Transcaspia.

The white collar and maroon patches on the throat form characters by which this species may readily be recognised, but even apart from these it does not bear a very close resemblance to any of the species which have hitherto been described.

OCHOTONA KOSLOVI (Büchn.).

Lagomys koslovi Büchner, Mamm. Przewalski, i. p. 187 (1894).

Size rather large. General colour of the upper parts, which is uniform throughout, pale whitish buff tinged with vinaceous. Under parts and feet, which are thickly furred, white. Each hair is grey for about half its length at the base, the terminal half being vinaceous buff fading to whitish or ending in a dark brown tip, which last is never sufficiently conspicuous to modify

the general colour. Intermixed with the fur proper are some long black bristles. I fancy that in its changes of pelage this species closely follows *O. ladacensis*, for at the end of summer it is of a bright golden buff due to the wearing off of the terminal portions of the winter pelage described above. The long black bristles, however, do not wear down and thus become more conspicuous.

The *skull*, which is well figured by Büchner, is rather short in the muzzle, giving it a broad and thick-set appearance. The muzzle is both short and narrow, and possibly in correlation with this we find the anterior terminal portion of the nasals tending to turn upwards to a marked extent and having a broad vertical portion. The foramina are as in *O. rufescens*.

Dimensions of skin (after Büchner). Head and body 240 mm.; hind foot 42; ear 19.5.

Skull. Greatest length 44 mm.; basal length 33; zygomatic breadth 27.2; length of nasals 14.3; length of molar series 10.

Habitat. Northern Thibet.

This species may easily, apart from skull-characters, be distinguished from *O. ladacensis*, with which alone it could be confused, by the ears being yellow and not rufous, the tips white *not* black, and the under parts snowy white and *not* yellowish.

OCHOTONA PUSILLA (Pall.).

Lepus pusillus Pallas, Glires, p. 37, pl. i. (1778); Schreb. Säugth. iv. p. 906, pl. 237 (1792).

Lagomys pusillus (Pall.), Desm. Mamm. p. 353 (1820); Cuv. Règne Anim. p. 219 (1829); Waterh. Mamm. ii. p. 19, pl. i. fig. 2 (1848).

This is the smallest species of the genus as yet known. The general colour above, which is uniform, is dark brown, grizzled with white where the whitish median portion of each hair shows through. Under parts white; ears and feet grizzled, the former having a conspicuous ring of white hairs growing from their inner margin.

The *skull*.—From the material at hand I am unable to say much about the skull, which is small but well proportioned, the muzzle being rather stout and short. The foramen is very typical of the group in which I have placed it.

Dimensions (approx. from stuffed specimen). Head and body 145 mm.; hind foot 27; ear 14.

Skull. Zygomatic breadth 20 mm.; length of nasals 12; length of molar series 7; length of palate from henselion 8.5.

Habitat. S.E. Russia and thence eastward to Siberia.

Material is so scarce that it is impossible to say much concerning this species, which may be recognised by its small size and the white rims to the ears, in which characters it approaches *O. hodgsoni* from Kashmir.

OCHOTONA WARDI Bonhote.

Ochotona wardi Bonhote, Abstr. P.Z.S. 1904, No. 10, p. 13, Nov. 22.

In the summer pelage, worn from June to September, the whole of the head, shoulders, and fore part of the body (excepting a small patch behind the ears, which is white) is bright chestnut (cinnamon-rufous, Ridgw.), becoming more vinaceous on the throat. The remainder of the upper parts is dark greyish rufous, each hair being black at its base with a light subterminal annulation, the tips being either dark or rufous. This latter colour encroaches greatly on the light portion often to its total exclusion, especially on the sides of the body. The under parts are white lightly washed with pale buff. The feet are of the same colour. Ears moderate in size, very scantily clothed with hair.

In the winter pelage this animal is of a uniform dark iron-grey all over, with the exception of the light patches behind the ear, which are white as in summer. Under parts dull white. Slight traces of rufous are generally to be found at the base of the shoulders, on the crown of the head, and along the flanks. The young resemble the adults in winter, but are slightly browner in general colour and have the rufous on the head and shoulders more marked.

The *skull* is very similar to that of the type of *O. roylei*, as figured in the original description, and does not show any great features of note. The combined foramen, while having the narrow anterior third and the slight constriction typical of the *rufescens* group, shows a tendency for the constriction to become less marked, but it can nevertheless be clearly made out in every example.

Dimensions of type in flesh. Head and body 187 mm.; hind foot 25; ear 22.5.

Skull. Greatest length 44 mm.; basal length 37; palatal length 17; length of foramen 12; zygomatic breadth 21; interorbital breadth 5; breadth of brain-case 17; length of molar series 9.

Habitat. Talien, Kashmir, 11,000 feet.

Type (in Coll. Brit. Mus.). A.E.W. No. 56. Ad. ♂. Collected on the 8th August, 1903.

In external appearance this species most nearly resembles *O. roylei*; the latter, however, is much darker and lacks the conspicuous white patches behind the ears.

OCHOTONA CURZONIE Hodgs.

Lagomys curzonie Hodgs. (*nec* Stoliczka) J. A. S. B. xxvi. p. 207 (1858); Günth. Ann. Mag. Nat. Hist. ser. 4, xvi. p. 230 (1875); Blanford, Fauna Br. Ind., Mamm. p. 457 (1891).

This is the first species of the group which I have called after it and which is very closely related to the *rufescens* group. The difference between the palatal foramina of the two is well shown by a comparison of the figures of *O. koslowi* (Büchn. Mamm.

Przewalski, pl. xxiv. fig. 14) and of *O. dauurica* (ibid. pl. xxv. fig. 2); in which it may be noticed that the sides of the foramen in *O. dauurica* diverge at once from their anterior point instead of continuing parallel for the first third of their length, and then tending to approach again before finally diverging, as in the *rufescens* group.

O. curzonie is a pale buff-coloured animal above and rather lighter below. Along the median area of the back the hairs are tipped with black and have a subterminal ring of rufous brown, the extent of the rufous varying in individual specimens. Behind the ears is a clear patch of a rather deeper buff than the rest of the body. The ears are of moderate size, clothed on both sides with fairly long whitish hairs. Feet pale buff.

The *skull* of this species is small and narrow. Apart from the palatal foramen, of which mention has already been made, the chief point of note is the postorbital process of the zygoma, which is very long and narrow; the posterior nares are similarly modified.

Dimensions (approx. from skin). Head and body 170 mm.; hind foot 28; ear 19.

Skull. Palatal length 15 mm.; zygomatic breadth 20; length of nasals 12; length of molar series 8; interorbital breadth 4.

Habitat. The type-locality of this species is the Chumbi Valley in the north of Sikkim, whence it apparently extends westward as far as Kashmir.

The series of this species at my disposal is so small, that I am unable to give any particulars of its seasonal changes should any occur, but from the specimens before me it appears to be a very uniform species.

OCHOTONA MELANOSTOMA (Büchn.).

Lagomys melanostomus Büchn. Mamm. Przewalski, i. p. 177, pl. xxii. (1890).

Except in its slightly larger size I can find, after careful comparison of a co-type of *melanostoma* with the types of *curzonie*, no other distinguishing characteristics between these two species, and possibly a larger series of the latter would prove them to be identical. Büchner, in his original description, had apparently overlooked *O. curzonie*, as he only distinguishes it from *O. dauurica*, from which it differs in its yellowish under parts and black muzzle. The general colour of the winter pelage above is sandy brown grizzled with darker brown or blackish. Each hair at its base is grey, shading to light brown and ending in a dark tip. Interspersed over the upper parts are long uniformly black hairs. The under parts are dirty yellowish white.

In summer the hairs wear down so that the light-brown subterminal rings become more conspicuous, the black tips being nearly or quite worn away; the long and uniformly black hairs, however, remain, so that the grizzled appearance is not altogether lost, but the animal becomes brighter and browner and the under parts tend to become of a purer white.

The *skull*, except in size, does not differ from that of *O. curzonice*.

Dimensions (after Büchner). Head and body 235 mm.; hind foot 34; ear 21.

Skull. Greatest length 41 mm.; basal length 36; palatal length 16; zygomatic breadth 21·5; length of nasals 13; length of molar series 9; interorbital breadth 4.

Habitat. Kuku-noor and Gannsu, N. Thibet.

OCHOTONA DAURICA (Pall.).

Lepus dauricus Pall. Reise, iii. 1776, p. 692.

Lagomys dauricus (Pall.), Büchn. Mamm. Przewalski, i. p. 172, pl. xxii. fig. 1 & pl. xxv. figs. 1-5 (1890).

The general colour of this species is a very pale buff, lighter on the flanks and rather yellower along the centre of the back and over the forehead. Each hair is dark slate-grey at the base, succeeded by a whitish portion, increasing in colour towards the tip, which is sometimes dark brown. Ears well covered with whitish hairs; feet white. Under parts pure white, having occasionally a yellowish collar round the neck.

The skulls at my disposal are too fragmentary for a detailed description. Büchner, however, gives a good figure, from which it appears to differ but little from the nearly allied species. Its most marked features are the bullæ, which are large, prominent, and rounded.

Dimensions (after Büchner). Head and body 220 mm.; hind foot 14·5; ear 19.

Skull. Palatal length 18 mm.; length of nasals 14·5; length of molar series 8·5.

Habitat. Originally described from Dauria.

Much confusion seems to exist over this species, which closely resembles at least three others, viz. *O. curzonice*, *melanostoma*, and *ogotona*.

The black muzzle of *O. melanostoma* serves at once as a distinguishing character, while from *O. curzonice* the paler colour of the present species as well as the longer and softer coat form characters by which it may always be distinguished.

From *O. ogotona*, to which it bears a greater external resemblance, and with which it has been confounded by Büchner, it may be distinguished by its much smaller size, while the skull-characters are very distinct.

OCHOTONA MACROTIS (Günth.).

Lagomys macrotis Günth. Ann. Mag. Nat. Hist. ser. 4, xvi. p. 231 (Sept. 1875); Blanford, Yark. Mamm. p. 75 (1879); Scully, Ann. Mag. Nat. Hist. ser. 5, vol. viii. p. 100 (1891); id. P. Z. S. 1881, p. 207; W. L. Sci. Cat. Mamm. Ind. Mus. p. 110 (1891); Blanford, Faun. Br. India, Mamm. p. 457 (1891).

Lagomys auritus Blanford, J. A. S. B. vol. xlv. p. 111 (Oct

1875); id. J. A. S. B. xlv. p. 326 (1877); id. Yark. Mamm. p. 74, pl. vi. fig. 2, pl. vii *a*. fig. 2 (1879).

Lagomys griseus Blanford, J. A. S. B. vol. xlv. p. 111 (Oct. 1875); id. Yark. Mamm. p. 77, pl. vii. fig. 1, pl. vii *a*. fig. 3 (1879).

Superficially this species is not unlike a pale form of *O. rutila*, but a glance at the skull shows it to belong to the *curzonie* group, and its large ears will prevent confusion with any other members of that group.

This species is of moderate size, and the general colour above is pale brownish grey, each hair being dark-coloured at its base, white in the centre, and pale buff subterminally with a black tip. Apparently it moults only once a year, in August, but in summer the hair is much abraded and the animal is then much whiter. The under parts and feet are white. Along the sides of the face, across the shoulders, and from the nose over the occiput, the general greyish colour is tinged with rufous, this rufous being more marked in summer; the eye is surrounded by an ill-defined greyish ring. The inner sides of the ears and a patch behind are white, the outer sides having dark brown hairs with white tips.

The skull belongs typically to the *curzonie* group, the sides of the combined palatal and incisive foramina sloping outwards in a regular slant from their anterior point. Another peculiarity about the skull is the presence of two small oval foramina above and in front of the orbit at the anterior end of the frontal bones. These foramina, which measure about 3 mm. by 1.5 mm., are constant and uniform in all specimens of this species that I have examined, though they may also be found sporadically throughout the genus. In other respects there is nothing of note to be observed in the skulls.

Dimensions (from skin). Head and body 200 mm.; ear 27; hind foot 32.

Skull. Palatal length 17 mm.; zygomatic breadth 23; length of nasals 14; length of molar series 9.

Habitat. Doba, Kuenlun Mts.; Pamirs; Ladak.

The large ears, correlated with skull-characters, enable this species to be easily recognised.

There are two species, *O. aurita* and *O. grisea*, described by Blanford, which may probably be assigned to this species. I have not had the opportunity of comparing any specimens, but from the description and figures there can be no doubt that, if not identical, they are very closely allied to *O. macrotis*.

OCHOTONA ROYLEI (Ogilby).

Lagomys roylei Ogilby, Royle's Him. Bot. p. lxix, pl. iv. (1839) id. Geoffr. Voy. Jacquemont, Mamm. p. 62 (1841); Waterh. Mamm. ii. p. 26 (1848); Adams, P. Z. S. 1858, p. 520; Blyth Cat. p. 133 (1863); Jerd. Mamm. p. 226 (1867); Blanf. J. A. S. B. xli. pt. 2. p. 35 (1872); Lydekker, J. A. S. B. xlv. p. 286 (1877); Scully, Ann. Mag. Nat. Hist. ser. 5, vol. viii. p. 100 (1881)

Büchm. Mamm. Przew. i. p. 156, pl. xxiii. figs. 1, 2 (1890); W. L. Sclater, Cat. Mamm. Calc. Mus. p. 112 (1891); Blauf. Faun. Br. Ind., Mamm. p. 456 (1891).

Lagomys nepalensis Hodgson, J. A. S. B. x. p. 854 (1841), fig. p. 816; id. J. A. S. B. xi. p. 289 (1842); Waterh. Mamm. ii. p. 24 (1848); Gray, Cat. Hodgs. Coll. p. 21 (1846); Horsfield, Cat. E.-I. Mus. p. 148 (1851); Günth. Ann. Mag. Nat. Hist. (4) vol. xvi. p. 230 (1875).

General colour in winter dark brown grizzled with buff, each hair being dark brown with a buff subterminal annulation. The head shows traces of rufous. Under parts white. Feet rufous-buff. The summer pelage is similar, but the head, shoulders, and flanks are bright rufous (hazel, Ridgw.), the head being slightly grizzled with black. Under parts sometimes showing a pale median rufous streak.

The *skull* shows no very distinctive features. It is long and narrow, and the nasal bones, especially at their anterior end, broad.

Dimensions (from skin). Head and body 175 mm.; hind foot 32; ear 23.

Skull. Palatal length 15.5 mm.; zygomatic breadth 20; length of nasals 12; length of molar series 1; interorbital breadth 6; breadth of nasals 7.

Habitat. Kashmir; Nepal.

The external differences between this species and *O. wardi* have been pointed out in the description of the latter species; and although somewhat alike, the skull-characters enable them to be easily separated. The series of this species being very small, I have been unable to separate *roylei* from *nepalensis*. I fancy, however, that a large series would prove them to be subspecifically distinct. The type of *roylei* came from the Choor Mts., a little to the west of Kumaon, and the type of *nepalensis* from E. Nepal, north of Katmandu.

OCHOTONA HODGSONI (Blyth).

Lagomys hodgsoni Blyth, J. A. S. B. x. p. 817, pl. p. 844 (1841); Waterh. Mamm. ii. p. 23 (1848); Gray, Ann. Mag. Nat. Hist. ser. 3, xx. p. 220 (1867).

Lagomys tibetanus Milne-Edw. Nouv. Arch. Mus. vii. p. 93 (1871); id. Rech. Mamm. p. 314 (1872).

General colour above dull dark reddish brown, shading to pale buffy brown on the flanks. The under parts are of a dirty white, having a reddish median band. The upper sides of the feet are lighter than the rest of the body and slightly tinged with rufous.

The skulls are so fragmentary that I am unable to give a detailed description. The incisive foramina are much more triangular in shape than in *roylei*, and their margins tend to slope out gradually from the apex.

Dimensions (as given by Blyth). Head and body 6 ins. (150 mm.); hind foot 1.25 in. (32 mm.).

Skull. Palatal length 12 mm.; zygomatic breadth 15; length of molar series 6.5; length of nasals 10; interorbital breadth 4.

Habitat. Kashmir; Tibet; Szechuen.

This species is allied to the preceding, the dull pelage of which it greatly resembles; its much smaller size will, however, enable it to be easily recognised.

I have seen no specimens from Kashmir, the type-locality of this species, but there is a series of specimens in the Museum from E. Sikkim, which agree so closely with Blyth's description, that I have no hesitation in referring them to this species. I have also examined specimens from Szechuen, which are indistinguishable from those of E. Sikkim, as well as a single individual from Gansu in N. Thibet. M. Milne-Edwards' species from Moupin is also, in my opinion, identical with *O. hodgsoni*, of which it therefore becomes a synonym.

Since the foregoing has been in the possession of the Society, Mr. Marcus W. Lyon, jun., has published* an exhaustive paper on "The Classification of the Hares and their Allies," founded almost entirely, as would naturally be the case, on their osteological characters. He divides the genus *Ochotona* (l. c. p. 438) into three subgenera founded on cranial characters, and it is gratifying to find that his subgenera correspond with the three groups into which I have found it necessary to subdivide the genus, as set out in this paper. For the names of his subgenera Mr. Lyon makes use of two previously existing, viz. *Ochotona* and *Pika*, and coins a new one, *Conothoa*. The subgenera *Ochotona*, *Conothoa*, and *Pika* represent respectively the *rufescens*, *curzoniae*, and *ladacensis* groups of this paper.

With regard to the actual classification of some of the species, there are several apparent discrepancies between Mr. Lyon's results and my own. In considering these, however, it must be borne in mind that Mr. Lyons was treating the subject from a larger point of view and also almost entirely from the osteological side; whereas in my work geographical distribution and external characters were more especially studied, and I had the additional advantage of superior series of skins, owing to many of the actual types being in the Museum, as well as a nearly complete set from Büchner of the various species he had described.

The first discrepancy is the grouping together of *O. ladacensis* and *O. koslowi*. The figure given by Büchner of the skull of the former does not agree with the type skull, as I have already pointed out (*antea* p. 209), which undoubtedly belongs to the same group as *O. alpina*, and there can be but little doubt that Büchner's figure misled Mr. Lyon.

The next discrepancy is with regard to *O. erythrotis*, which Mr. Lyon, on the strength of Büchner's figure, places in the *curzoniae* group. I have not been able to examine specimens of *O. erythrotis*, but there are in the Museum a series of *O. rutila*

* Smithsonian Miscell. Coll. vol. xlv. p. 321 (1904).

which, according to Büchner, very closely resemble *O. erythrotis*. Büchner's actual words are :—" Die Incisivöffnung ist durch einen paarigen Vorsprung des Zwischenkiefers in zwei Abschnitte, eine vordere und eine hintere Incisivöffnung getrennt; in Form und Grösse gleichen diese Oeffnungen vollständig denjenigen bei *L. rutilus*"; and on the strength of this I have no hesitation in placing *O. erythrotis* in the *ladacensis* (subgen. *Pika*) group, a finding with which Mr. Lyon, had he seen specimens of *O. rutila*, would, I feel, sure agree.

The only other discrepancies relate to *O. curzoniae*, *O. daurica*, *O. melanostoma*, and *O. pusilla*, but as Mr. Lyon has never seen specimens or figures of any of these, his conclusions with regard to them must of necessity be of a rather speculative character.

To sum up shortly, we may fairly consider Mr. Lyon's conclusions as regards the main divisions of the genus to be clearly borne out by the foregoing pages, and, so far as the Palæarctic species are concerned, this paper may claim to have clearly shown to which subgenus any particular species should be assigned.

5. On some Edible and other New Species of Earthworms from the North Island of New Zealand. By W. B. BENHAM, D.Sc., M.A., F.Z.S., Professor of Biology in the University of Otago, New Zealand.

[Received May 31, 1904.]

(Text-figures 41-82.)

The Earthworms that have hitherto been described from New Zealand by Mr. Beddard and by myself have been collected, with one exception, from the South Island, and indeed from the southern half of that island. The majority of these belong to the genera *Maoridrilus*, *Notiodrilus*, and *Plagiochaeta*, belonging to the subfamily Acanthodrilinae, and to the genus *Octochaetus*, of Michaelsen's subfamily Octochaetinae; and the general *facies* of our South Island fauna is very characteristic and quite distinct from the Australian Earthworms. But I have recently been able to examine specimens of a number of species from various parts of the North Island, with the astonishing result that they present a striking contrast to those of the South Island, and as striking a resemblance to the Australian Cryptodrilids. Even in the South Island we have in two species of *Diporochaeta*, and the lacustrine species of *Plutellus*, representatives of the Australian fauna; but whereas the species just referred to are by no means common, and might probably be regarded as comparatively recent arrivals, possibly even accidentally introduced from the adjoining continent, such an explanation appears to be quite inadmissible for the northern species; for the new genus *Tokea*, which I find it necessary to make, is represented by seven species in quite distant parts of the North Island; and the Acanthodriline genera are just as scarce